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AMT128503

1.25 Gb/s Integrated 850 nm MSM-TIA

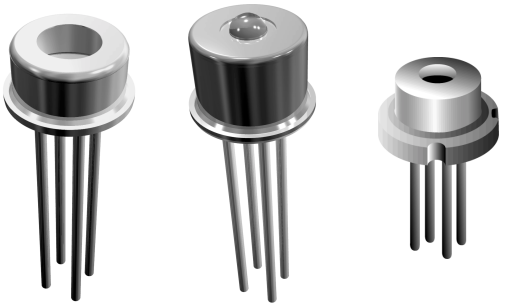
Data Sheet - Rev. 0

FEATURES

- 1.25 Gb/s Differential Output TIA
- 3.3V Operation
- Automatic Gain Control
- 850nm Photodetector with 100 μm x 100 μm Active Area
- Integrated MSM detector & TIA
- TO-46 Ultra Flat Window or Lens Package
- TO-56 Ultra Flat Window Package

APPLICATIONS

- Gigabit Ethernet (1.250Gb/s)
- Fibre Channel (1.0625 Gb/s)



TO-46F Ultra Flat Window Package	TO-46L Lens Package	TO-56F Ultra Flat Window Package

PRODUCT DESCRIPTION

The ANADIGICS AMT128503 is a 3.3V monolithically integrated Metal-Semiconductor-Metal (MSM) photodetector and transimpedance amplifier (TIA) used to convert an 850nm input optical signal into a differential output voltage, and is manufactured in ANADIGICS' 6" GaAs wafer fabrication facility. The integrated MSM and TIA receiver maximizes the receiver performance by minimizing the photodetector input parasitics to the TIA and internally biasing the photodetector to achieve high sensitivity, bandwidth and overload performance. As an integrated product the reliability is inherently better than a discrete solution, and both the MSM-TIA integrated circuit and TO46 flat window, TO46 lens and TO56 flat window packaged receiver pass stringent reliability requirements. These products are readily designed into receivers and transceivers for Gigabit Ethernet and Fibre Channel applications.

Figure 1: AMT128503 Equivalent Circuit

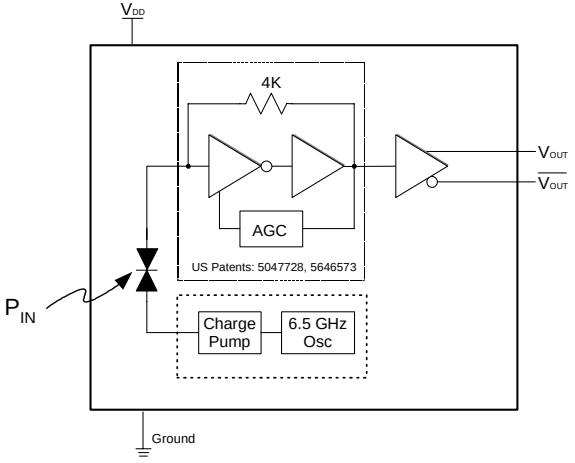


Table 1: Absolute Maximum Ratings

V_{DD}	6.0 V
P_{IN}	+ 5 dBm
T_S	Storage Temp. - 65 °C to 125 °C

Table 2: Electrical Characteristics

PARAMETER	MIN	TYP	MAX	UNIT
Wavelength (λ)	770	850	860	nm
Detector Active Area		100 x 100		µm
Small Signal Differential Responsivity (1) (@ 50 MHz)	1000			V / W
Bandwidth(1)	1000		1500	MHz
Low Frequency Cutoff		300	1000	kHz
Output Resistance	25	40	60	Ω
Optical Overload (2)	0			dBm
Optical Sensitivity (2)	-20	- 22		dBm
Differential Output Voltage (3), (4)		700		mV
T_{RISE} & T_{FALL} (20 - 80%) (3), (4)		260		ps
Duty Cycle Distortion (3), (5)		4	10	%
RMS Jitter (3), (5), (6)		15		ps
Total Jitter (pk-pk) (3), (5), (7)		90		ps
Supply Current			55	mA
Operating Voltage Range	+ 3.0	+3.3	+3.6	V
Operating Ambient Temperature Range	0		70	°C

(1) Measured at –14 dBm optical input power with output connected into R_L = 100Ω (differential)
(2) Measured at 10^{-10} BER with a 2^7-1 PRBS at 1.25 GB/s
(3) Input optical power = -3 dBm, R_L = 100 Ω (differential).
(4) Measured with a 625 MHz, 50% duty cycle square wave.
(5) Measured with a 1.25 Gb/s, 2^7-1 PRBS.
(6) 1σ about the center eye crossing.
(7) 6σ about the center eye crossing.

Table 3: Package Pin Description

PIN	T46F/T46L Description	T56F Description
1	VOUT - TIA Output Voltage (non-inverted) Logical '1' with optical input	VDD - Positive Supply Voltage
2	VDD - Positive Supply Voltage	$\overline{\text{VOUT}}$ - TIA Output Voltage (inverted) Logical "1" with optical input
3	$\overline{\text{VOUT}}$ - TIA Output Voltage (inverted) Logical '0' with optical input	Ground (case is grounded)
4	Ground (case is grounded)	VOUT - TIA Output Voltage (non-inverted) Logical "1" with optical input

Figure 2: Eye Diagram with an Optical Input Power of -17dBm

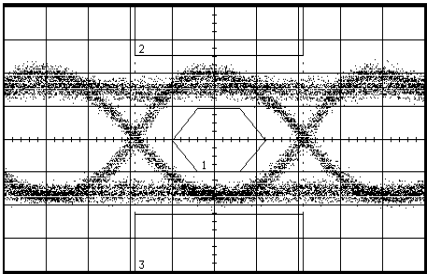


Figure 3: Eye Diagram with an Optical Input Power of -1.0dBm

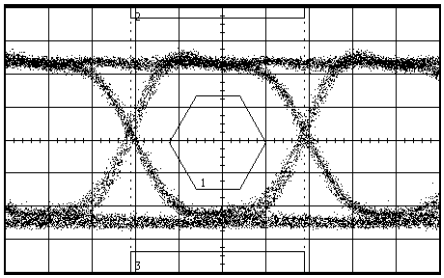


Figure 4: Supply Current vs Temperature

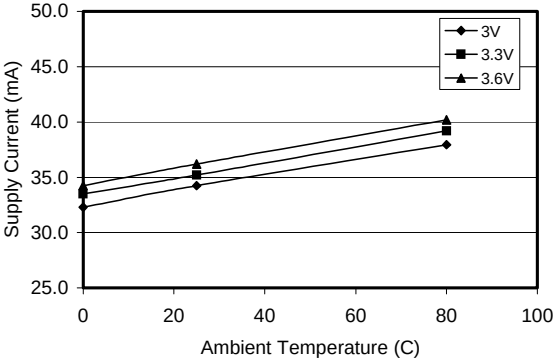


Figure 5: Bandwidth vs. Temperature

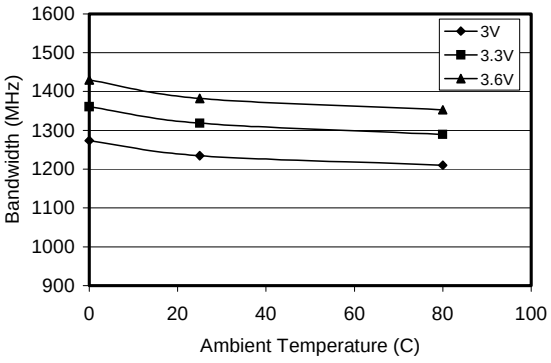


Figure 6: Differential Responsivity vs Temperature

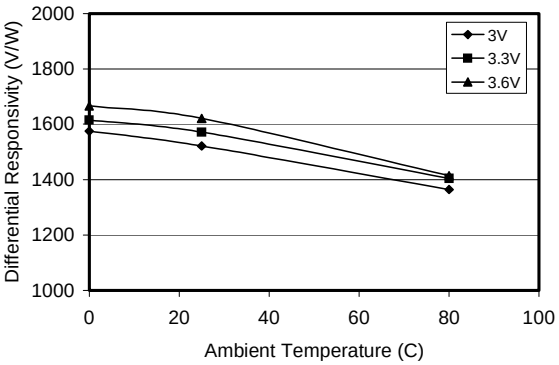


Figure 7: Sensitivity vs Temperature

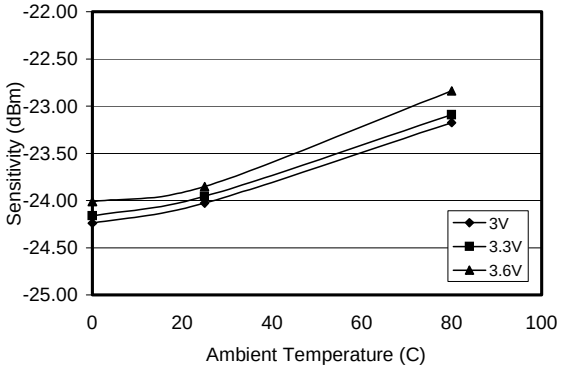


Figure 8: Test Setup for Frequency Response

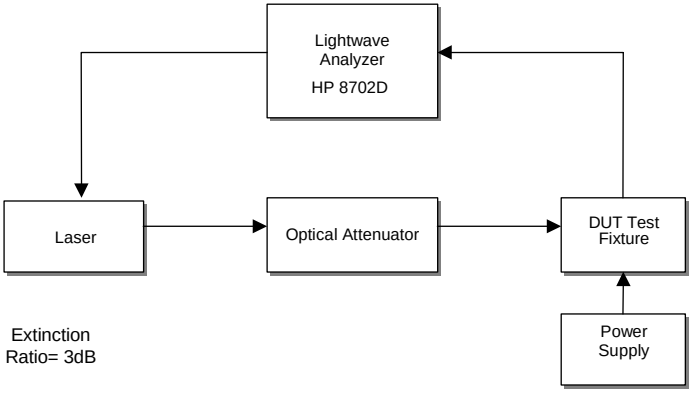


Figure 9: Test Setup for Sensitivity

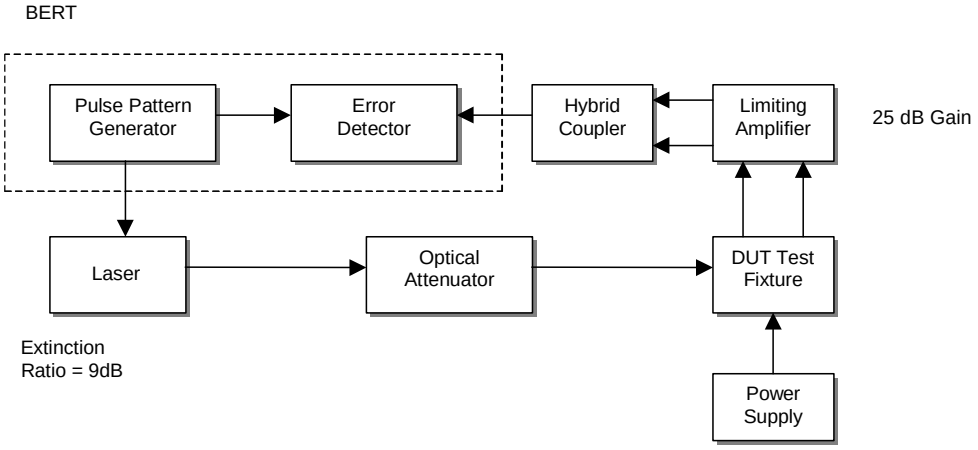


Figure 10: Test Setup for Eye Measurements

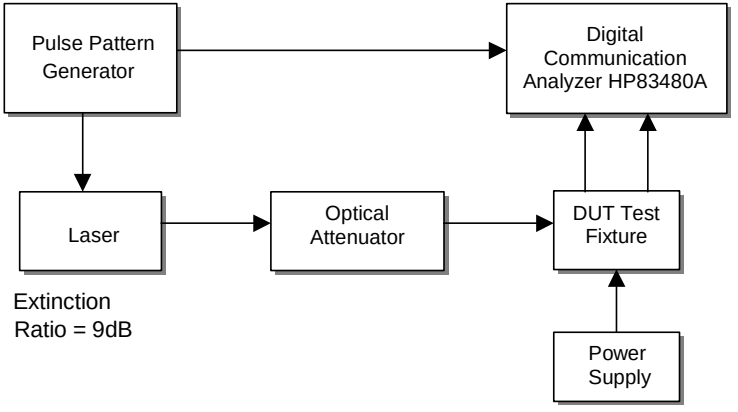


Figure 11: DUT Test Fixture Schematic

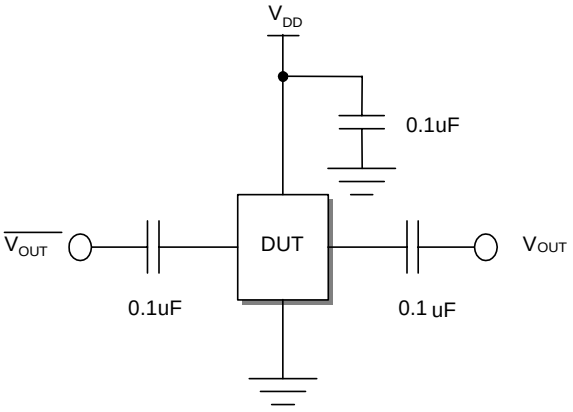
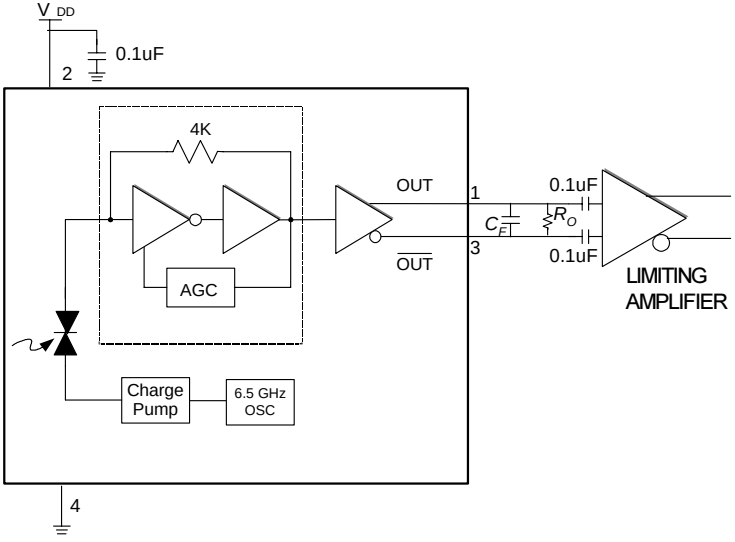


Figure 12: Application Schematic



C_F is an optional single pole noise filter

$$C_F = \frac{1}{2\pi f_c R}$$

f_c is the desired cutoff frequency

R = 50 Ω

R_O is required with high input resistance limiting amplifiers

R_O = 100 Ω

Figure 13: Evaluation Board Schematic

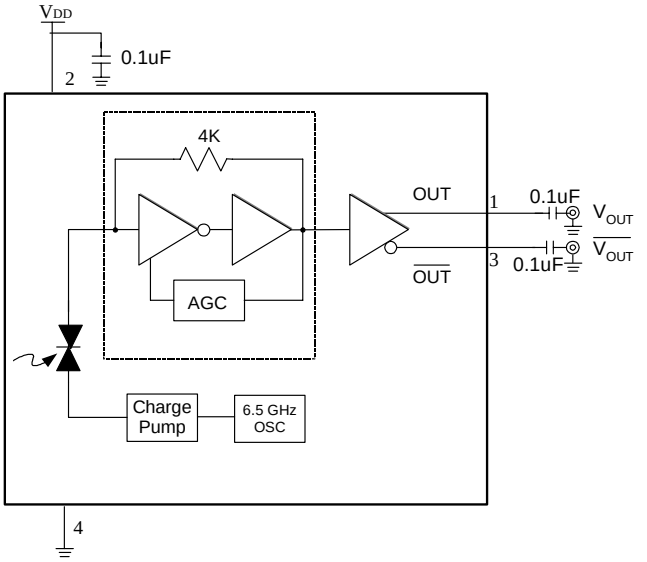


Figure 14: Evaluation Board Layout

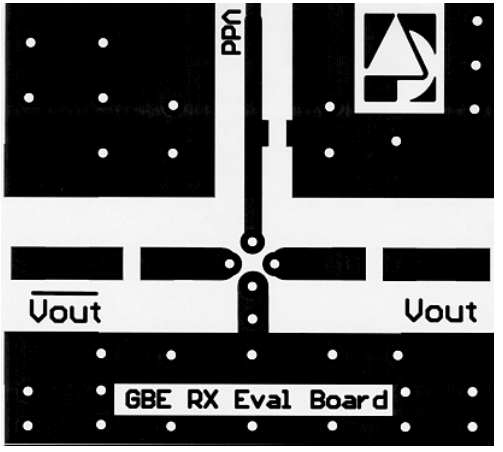
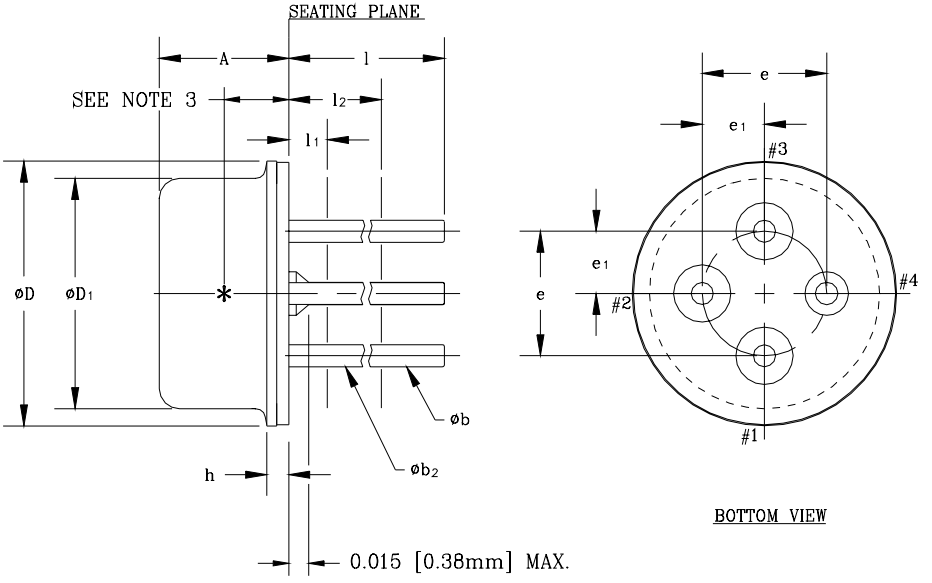


Figure 15: T46F Package Outline Diagram



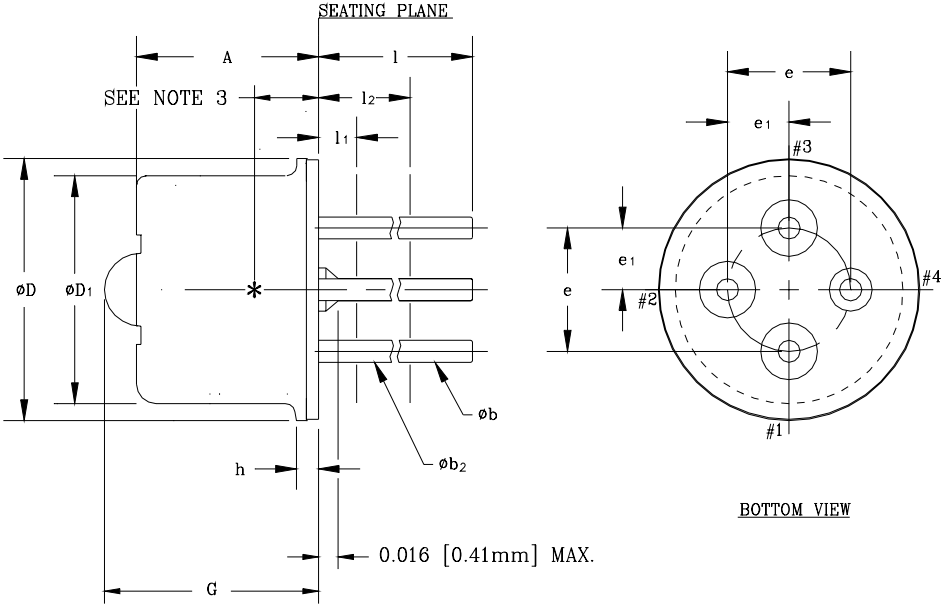
MM CONTROLLING DIMENSIONS

SYMBOL	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	0.098	0.110	2.50	2.80	
øb	0.016	0.020	0.41	0.51	1
øb2	0.012	0.019	0.30	0.48	1
øD	0.212	0.218	5.38	5.54	
øD1	0.181	0.187	4.60	4.75	
e	0.100 T.P.		2.54 T.P.		2
e1	0.050 T.P.		1.27 T.P.		2
h	0.014	0.022	0.36	0.56	
l	0.500	0.540	12.70	13.70	1
l1	–	0.050	–	1.27	1
l2	0.250	–	6.35	–	1

NOTES:

1. (FOUR LEADS) øb2 APPLIES BETWEEN l1 AND l2. øb APPLIES BETWEEN l2 AND 0.5 [12.70mm] FROM SEATING PLANE. DIAMETER IS UNCONTROLLED IN l1 AND BEYOND 0.5 [12.70mm] TO END OF PIN.
2. MAXIMUM DIAMETER LEADS AT A GAGING PLANE 0.054 [1.37mm]+0.001 [0.025mm] −0.000 [0.000mm] BELOW SEATING PLANE TO BE WITHIN 0.007 [0.178mm] OF THEIR TRUE POSITION RELATIVE TO MAXIMUM−WIDTH TAB AND TO THE MAXIMUM 0.212 [5.40mm] DIAMETER MEASURED WITH A SUITABLE GAGE. WHEN GAGE IS NOT USED, MEASUREMENT WILL BE MADE AT 0.250 [6.35mm] FROM SEATING PLANE.
3. INTERNAL OPTICAL HEIGHT = 0.052±0.003[1.31±.08]
4. BENT LEADS SHOULD NOT EXTEND OUTSIDE DIAMETER (øD) OF CAP OR TOUCH EACH OTHER.
5. ALL DIMENSIONS ARE REFERENCE ONLY−EXCEPT A, D & h.
6. DETECTOR DIODE PLACEMENT ACCURACY: ⊕0.15MM[0.006] WITH RESPECT TO CENTER OF HEADER.(REF.ONLY)

Figure 16: T46L Package Outline Diagram



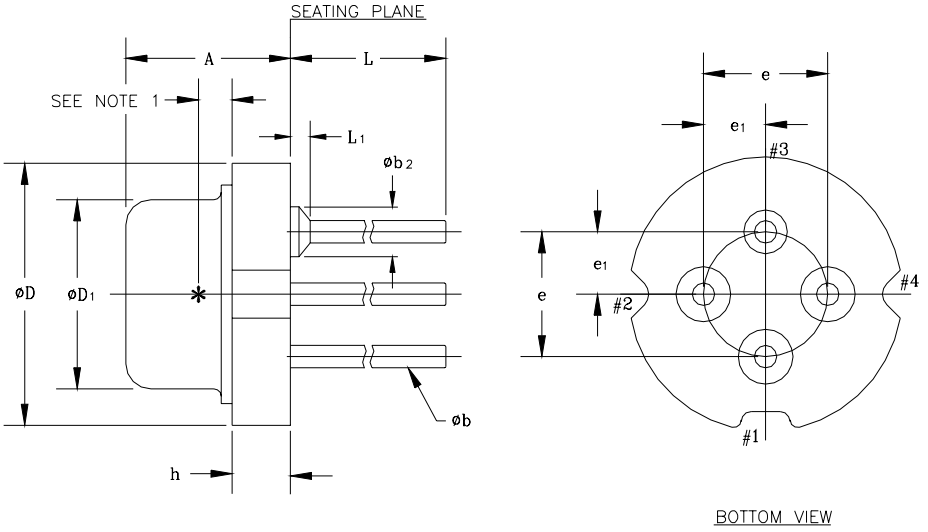
MM CONTROLLING DIMENSIONS

SYMBOL	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	--	0.160	--	4.00	
øb	0.016	0.020	0.41	0.51	1
øb2	0.012	0.019	0.30	0.48	1
øD	0.212	0.218	5.38	5.54	
øD1	0.181	0.187	4.60	4.75	
e	0.100 T.P.		2.54 T.P.		2
e1	0.050 T.P.		1.27 T.P.		2
h	0.014	0.022	0.36	0.56	
l	0.500	0.540	12.70	13.70	1
l1	–	0.050	–	1.27	1
l2	0.250	–	6.35	–	1
G	--	0.190	--	4.66	7

NOTES:

1. (FOUR LEADS) øb2 APPLIES BETWEEN l1 AND l2. øb APPLIES BETWEEN l2 AND 0.5 [12.70mm] FROM SEATING PLANE. DIAMETER IS UNCONTROLLED IN l1 AND BEYOND 0.5 [12.70mm] TO END OF PIN.
2. MAXIMUM DIAMETER LEADS AT A GAGING PLANE 0.054 [1.37mm]+0.001 [0.025mm] −0.000 [0.000mm] BELOW SEATING PLANE TO BE WITHIN 0.007 [0.178mm] OF THEIR TRUE POSITION RELATIVE TO MAXIMUM−WIDTH TAB AND TO THE MAXIMUM 0.212 [5.40mm] DIAMETER MEASURED WITH A SUITABLE GAGE. WHEN GAGE IS NOT USED, MEASUREMENT WILL BE MADE AT 0.250 [6.35mm] FROM SEATING PLANE.
3. INTERNAL OPTICAL HEIGHT = 0.052±0.003[1.32±0.08] DIE PLACEMENT ACCURACY FOR REF. ONLY.
4. BENT LEADS SHOULD NOT EXTEND OUTSIDE DIAMETER (øD) OF CAP OR TOUCH EACH OTHER.
5. ALL DIMENSIONS ARE REFERENCE ONLY−EXCEPT A, D & h.
6. DETECTOR DIODE PLACEMENT ACCURACY: ⌖ ±0.15MM[0.006] ALL DIRECTIONS
7. LENS HEIGHT = 0.65±0.1 [0.026±0.004]

Figure 17: T56F Package Outline Diagram



MM CONTROLLING DIMENSIONS

SYMBOL	MILLIMETERS		INCHES		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	3.10	3.50	0.122	0.138	
øb	0.41	0.48	0.016	0.019	
øb2	–	0.89	–	0.035	
øD	5.57	5.60	0.219	0.221	
øD1	3.80	3.90	0.150	0.154	
e	2.54 T.P.		0.100 T.P.		
e1	1.27 T.P.		0.050 T.P.		
h	1.10	1.30	0.043	0.051	
L	6.00	7.00	0.236	0.276	
L1	–	0.38	–	0.015	

NOTES:

1. INTERNAL OPTICAL HEIGHT = 0.70±0.04[0.028±0.0015]
2. BENT LEADS SHOULD NOT EXTEND OUTSIDE DIAMETER (øD) OF CAP OR TOUCH EACH OTHER.
3. ALL DIMENSIONS ARE REFERENCE ONLY, EXCEPT A, øD & h.
4. DETECTOR DIODE PLACEMENT ACCURACY: ⊕ 0.15MM[0.006] WITH RESPECT TO CENTER OF HEADER: REFERENCE ONLY.
5. CAN PLACEMENT ACCURACY: ⊕0.2MM[0.008] WITH RESPECT TO CENTER OF HEADER: REFERENCE ONLY.

Ordering Information

Part Number	Package Option	Package Description
AMT128503T46F	TO-46F	Ultra Flat Window
AMT128503T46L	TO-46L	Lens
AMT128503T56F	TO-56F	Ultra Flat Window

Notes

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WARNING

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